Utilizing Satellite-derived Precipitation Products in Hydrometeorological Applications

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Outline

- Introduction
- Data Products
- Services
- Application examples
- Summary
- URLs

Introduction

- Floods and droughts happen around the world each year.

2010 Floods in Pakistan ($9.5 billion in *damage* to property, crops and infrastructure; Death toll ~2000)

2011 Mississippi River Flooding (*Damages*: US$2 to 4 billion)

Droughts in Yunnan, China in 2009-10 ($1.1 billion in crop *damage)*

2012 North American Droughts (one of the worst)

Introduction (cont.)

- Research and applications require observational data
- Satellite remote sensing data products play an important role in remote and data sparse regions
- Data services are important to facilitate research and applications
- Examples of applications will be presented

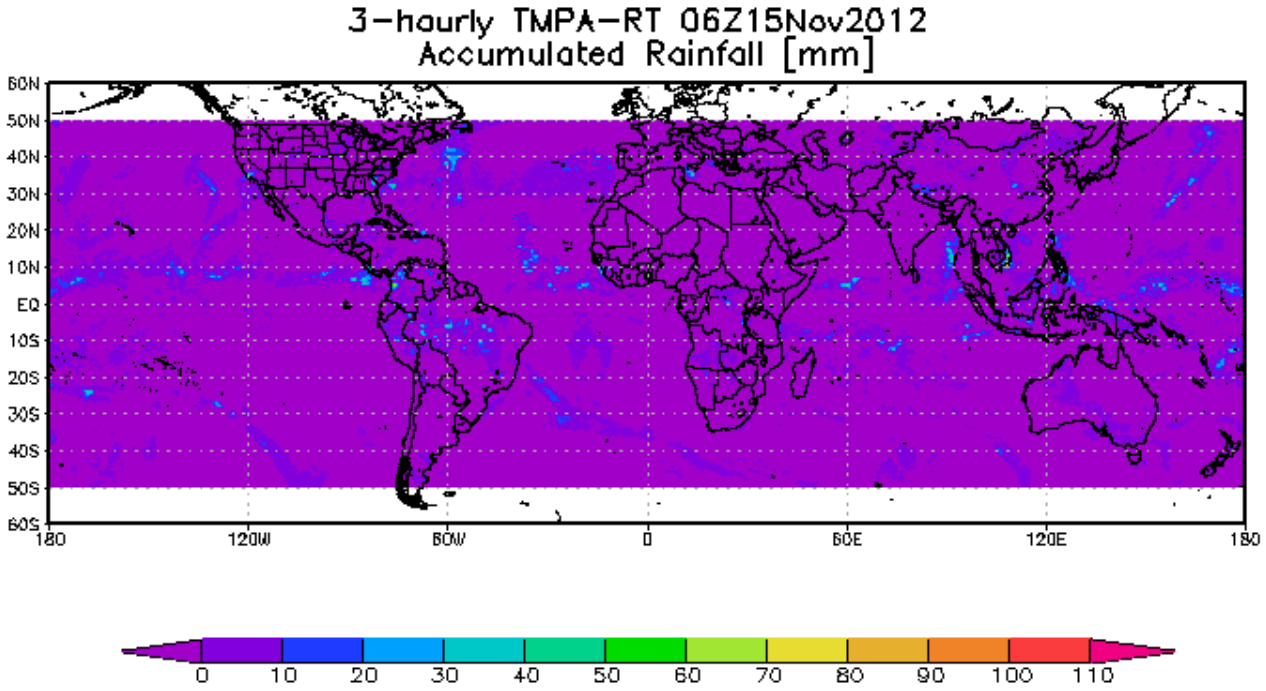
Data Products at NASA Goddard Earth Sciences Data and Information Services Center (GES DISC)

- Precipitation (TRMM and others)
- Hydrology (NLDAS, GLDAS)
- Reanalysis (MERRA, Modern-Era Retrospective Analysis for Research and Applications)

Precipitation Data Products at GES DISC

Near-real-time products:

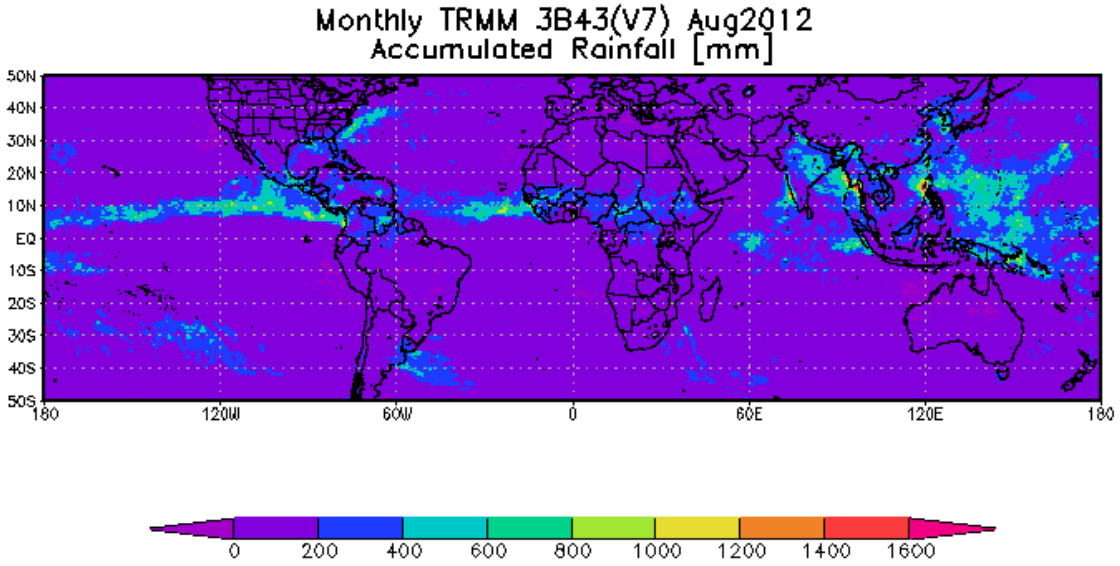
- TMPA 3B42RT (3-hourly, 0.25 deg., 50° S – 50° N) Jan. 2002 – present
- Daily (0Z – 21Z) derived from 3B42RT



Precipitation Products (cont.)

Research quality products:

- TMPA 3B42 (3-hourly, 0.25 deg., 50° S – 50° N) Jan 1998 – present
- Daily (0z – 21Z) derived from 3B42
- TMPA 3B43 (monthly, 0.25 deg., 50° S – 50° N)



Other Precipitation Products

- TRMM orbital products (case studies, algorithm development)
- TRMM Level-3 gridded products (inter-comparison, uncertainty)
- Multi-satellite and gauge combined products (GPCP, 2.5 deg, 1979 - present)
- Gauge only products (GPCC, Willmott)

Other related products:

- Precipitation (TRMM and others)
- Hydrology (North American Land Data Assimilation System (NLDAS) and Global Land Data Assimilation System (GLDAS) data products (both generated by GSFC's Hydrological Sciences Branch).
- Atmospheric dynamics (Modern Era Retrospective-Analysis for Research and Applications (MERRA) data assimilation datasets (generated by GSFC’s Global Modeling and Assimilation Office)

Snow, Soil Moisture, ET Products Summary

Source/product	Spatial Coverage	Spatial Resolution	Temporal Coverage	Temporal Resolution
MERRA: Rain rate, fractional snow cover, snow mass, snow depth, snow melt multi-layer soil moisture, ET	Global	2/3˚ x1/2˚	1979-present	6-hourly, Monthly
GLDAS: Snow melt, snowfall rate, snow water equivalent, multi-layer soil moisture, ET	Global	1˚ x1˚	1979-present and 1948- present (phase 2)	3-Hourly, Monthly
NLDAS: Snow melt, snowfall rate, snow water equivalent, multi-layer soil moisture, ET	North America	0.125˚ x0.125˚	1979-present	Hourly

Source: NASA Remote Sensing Training

Data Services

- User friendly TRMM Online Visualization and Analysis System (TOVAS; URL: http://disc2.nascom.nasa.gov/Giovanni/tovas/);
- Mirador (http://mirador.gsfc.nasa.gov/), a simplified interface for searching, browsing, and ordering Earth science data at GES DISC;
- Simple Subset Wizard (http://disc.sci.gsfc.nasa.gov/SSW/) for data subsetting and format conversion;
- Data via OPeNDAP (http://disc.sci.gsfc.nasa.gov/services/opendap/) that can be used for remote access to individual variables within datasets in a form usable by many tools, such as IDV, McIDAS-V, Panoply, Ferret and GrADS;
- GrADS-DODS Data Server or GDS (http://disc2.nascom.nasa.gov/dods/);
- The Open Geospatial Consortium (OGC) Web Map Service (WMS) (http://disc.sci.gsfc.nasa.gov/services/wxs_ogc.shtml) that allows the use of data and enables clients to build customized maps with data coming from a different network;
- Providing NASA gridded hydrological data access through CUAHSI HIS (Consortium of Universities for the Advancement of Hydrologic Science, Inc. - Hydrologic Information Systems).

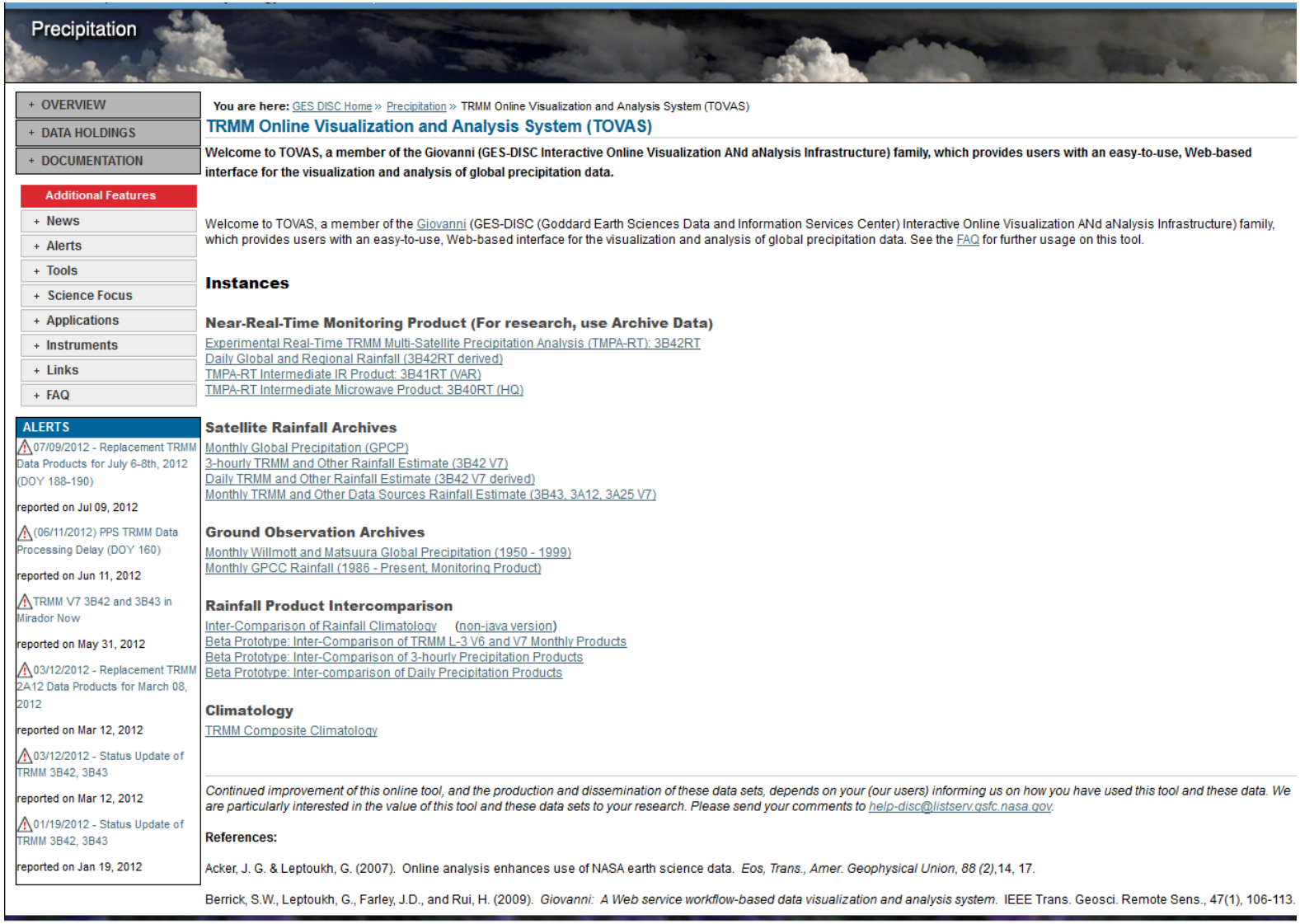
Giovanni TOVAS

- Easy to visualize and analyze precipitation data (area plot, time series, Hovemoller diagrams), without downloading data
- Data output in several formats (binary, ascii, HDF, NetCDF, kmz, etc.) for further analysis

Products in TOVAS

- Near-real-time
- Rainfall Archives
- Ground Observation Archives
- Other Ancillary Products

TOVAS Landing Page



Giovanni - TRMM Online Visualization and Analysis System (TOVAS) - Mozilla Firefox

File Edit View History Bookmarks Tools Help

http://gdata1.sci.gsfc.nasa.gov/daac-bin/G3/gui.cgi?instance_id=TRMM_Monthly

TRMM Online Visualization and Analysis System (TOVAS)

TRMM Level-3 Monthly Products.

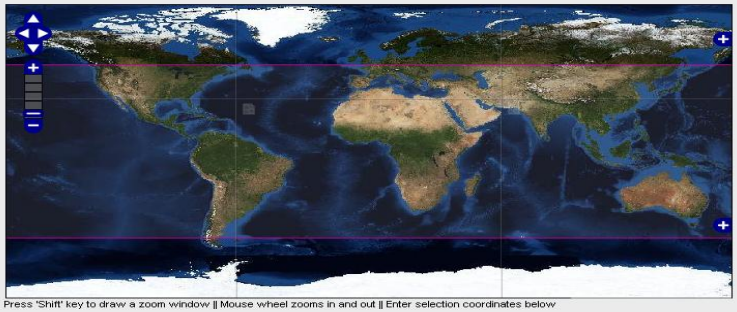
Home | Remove All

This web based tool is designed for visualization and analysis of the TRMM Level-3 data products. Users can generate plots for Lat-Lon Map, Time Series, Hovmoller diagram and more. Animation is available for Lat-Lon Maps. Results can be downloaded in HDF, NetCDF, ASCII, and Google Earth KMZ formats.

Note: The latent heating products of TRMM 2A12 and 3A12 over ocean surfaces should be regarded as experimental. Please confer first with the algorithm developers (by contacting the GES DISC) when using the latent heating product over ocean. Over-land latent heating estimates from TRMM products 2A12 and 3A12 should not be used, as they have not been evaluated quantitatively or qualitatively.

Select Constraints:

Spatial



Press 'Shift' key to draw a zoom window || Mouse wheel zooms in and out || Enter selection coordinates below

Pan Draw Box West: -180 North: 50 South: -50 East: 180 Update

Vertical Profile

Select a vertical profile range. The range selection is disabled unless a qualifying parameter is selected. In order to enable this option (and populate the list with values), select a 3D parameter. 3D parameters have at least three dimensions and are labeled with a '(3D)' in the 'Parameters' section.
NOTE: Selected 3D parameters **must** have the same **vertical** (i.e., 3rd dimension) units in order to enable the vertical level menu.

Upper Level ----

Lower Level ----

Parameters

Display: Data Product Info | Climatology Info | Units | Parameters with > 2 Dimensions | Only Parameters with Climatology

Analysis Options: Parameter | Climatology | Anomaly | Show Notes...

TRMM Level-3 Monthly Products

TRMM 3B43 V6 (1998/01/01 - 2008/11/30)

Parameter	Data Product Info		
Rain Rate	TRMM_3B43.006		1998/01 - 2008/11
Relative Error	TRMM_3B43.006		1998/01 - 2008/11

TRMM 3A12 V6 (1997/12/01 - 2008/11/30)

Parameter	Data Product Info		
Cloud Ice	TRMM_3A12.006		1997/12 - 2008/11
Cloud Liquid Water	TRMM_3A12.006		1997/12 - 2008/11
Conv Rain Rate	TRMM_3A12.006		1997/12 - 2008/11
Latent Heating	TRMM_3A12.006		1997/12 - 2008/11
Precipitation Ice	TRMM_3A12.006		1997/12 - 2008/11

TRMM 3A25 (1997/12/01 - 2008/11/30)

Parameter	Data Product Info		
Cond Mean Rain Rate (0.5x0.5 deg)	TRMM_3A25.006		1997/12 - 2008/11
Cond Mean Rain Rate (5.0x5.0 deg)	TRMM_3A25.006		1997/12 - 2008/11
Conv Mean Rain Rate (0.5x0.5 deg)	TRMM_3A25.006		1997/12 - 2008/11
Conv Mean Rain Rate (5.0x5.0 deg)	TRMM_3A25.006		1997/12 - 2008/11
Conv Rain Pixel Count (0.5x0.5 deg)	TRMM_3A25.006		1997/12 - 2008/11

Temporal

Begin Date Year 2008 Month Nov *(Date Begin: Dec 1997)*

End Date Year 2008 Month Nov *(Date End: Nov 2008)*

These are monthly products.

Select Visualization:

Lat-Lon map, Time-averaged | Visualization Help

Generate Visualization | Reset

Connecting to gdev.sci.gsfc.nasa.gov...

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File Edit View History Bookmarks Tools Help

http://gdata1.sci.gsfc.nasa.gov/daac-bin/G3/results.cgi?wsid=122963625118878app=latlonplot&instance_id=TRMM_Monthly

National Aeronautics and Space Administration

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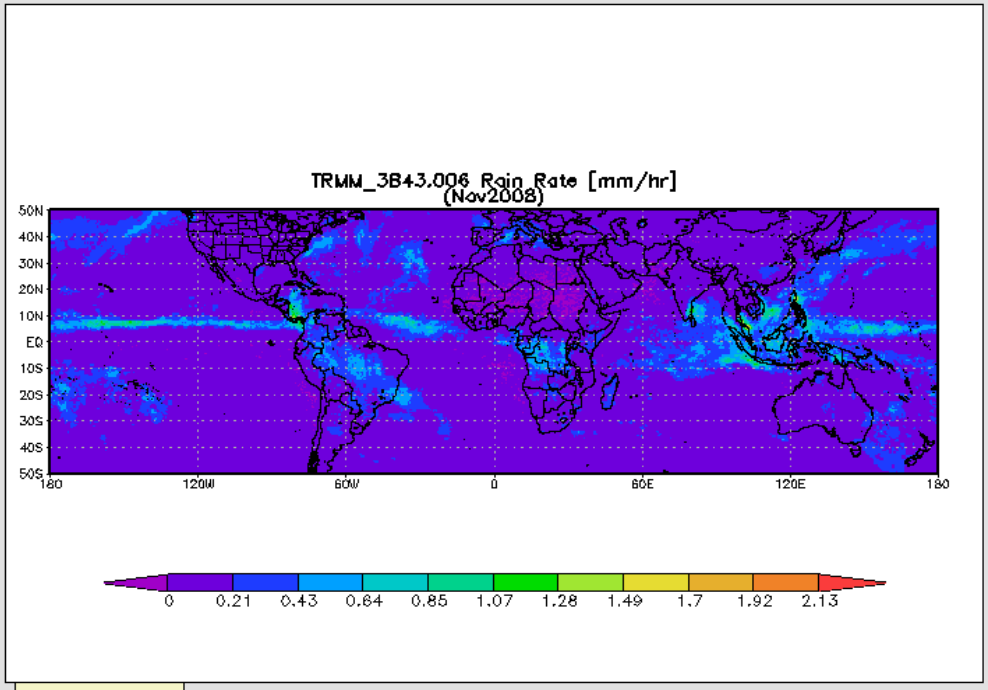
TRMM Level-3 Monthly Products.

Home Results #1 Remove All

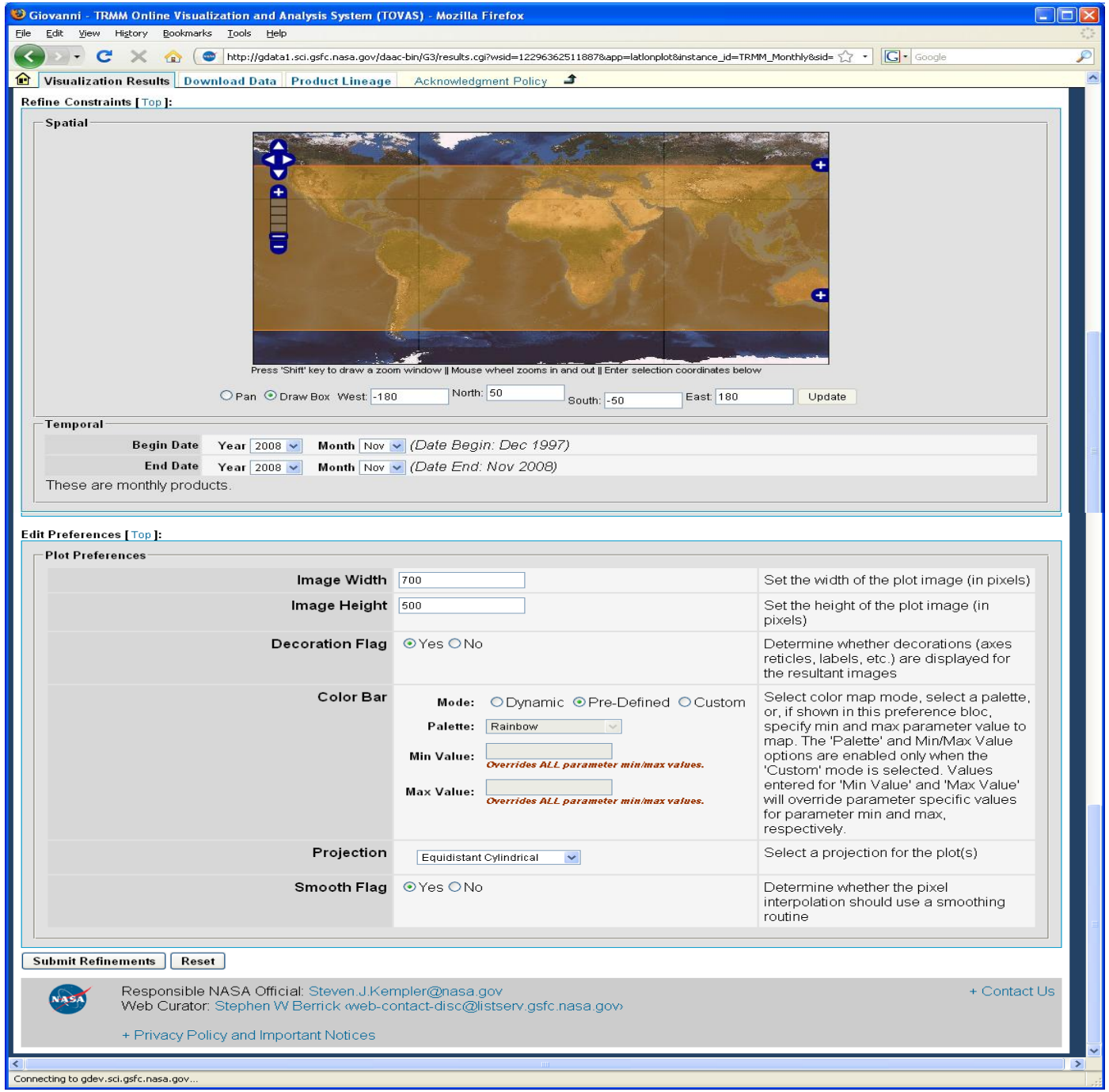
Visualization Results Download Data Product Lineage Acknowledgment Policy



Refine Constraints*

* Applies to the whole results set (all plots)

Connecting to gdev.sci.gsfc.nasa.gov...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http://gdata1.sci.gsfc.nasa.gov/daac-bin/G3/results.cgi?wsid=122963625118878app=latlonplot&instance_id=TRMM_Monthly&sid=
Visualization Results
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Refine Constraints [Top]:
Spatial
Press 'Shift' key to draw a zoom window || Mouse wheel zooms in and out || Enter selection coordinates below
Pan
Draw Box
West: -180
North: 50
South: -50
East: 180
Update
Temporal
Begin Date
Year 2008
Month Nov
(Date Begin: Dec 1997)
End Date
Year 2008
Month Nov
(Date End: Nov 2008)
These are monthly products.
Edit Preferences [Top]:
Plot Preferences
Image Width
700
Set the width of the plot image (in pixels)
Image Height
500
Set the height of the plot image (in pixels)
Decoration Flag
Yes No
Determine whether decorations (axes reticles, labels, etc.) are displayed for the resultant images
Color Bar
Mode: Dynamic Pre-Defined Custom
Palette: Rainbow
Min Value:
Overrides ALL parameter min/max values.
Max Value:
Overrides ALL parameter min/max values.
Select color map mode, select a palette, or, if shown in this preference bloc, specify min and max parameter value to map. The 'Palette' and Min/Max Value options are enabled only when the 'Custom' mode is selected. Values entered for 'Min Value' and 'Max Value' will override parameter specific values for parameter min and max, respectively.
Projection
Equidistant Cylindrical
Select a projection for the plot(s)
Smooth Flag
Yes No
Determine whether the pixel interpolation should use a smoothing routine
Submit Refinements
Reset
Responsible NASA Official: Steven.J.Kempler@nasa.gov
Web Curator: Stephen W Berrick <web-contact-disc@listserv.gsfc.nasa.gov>
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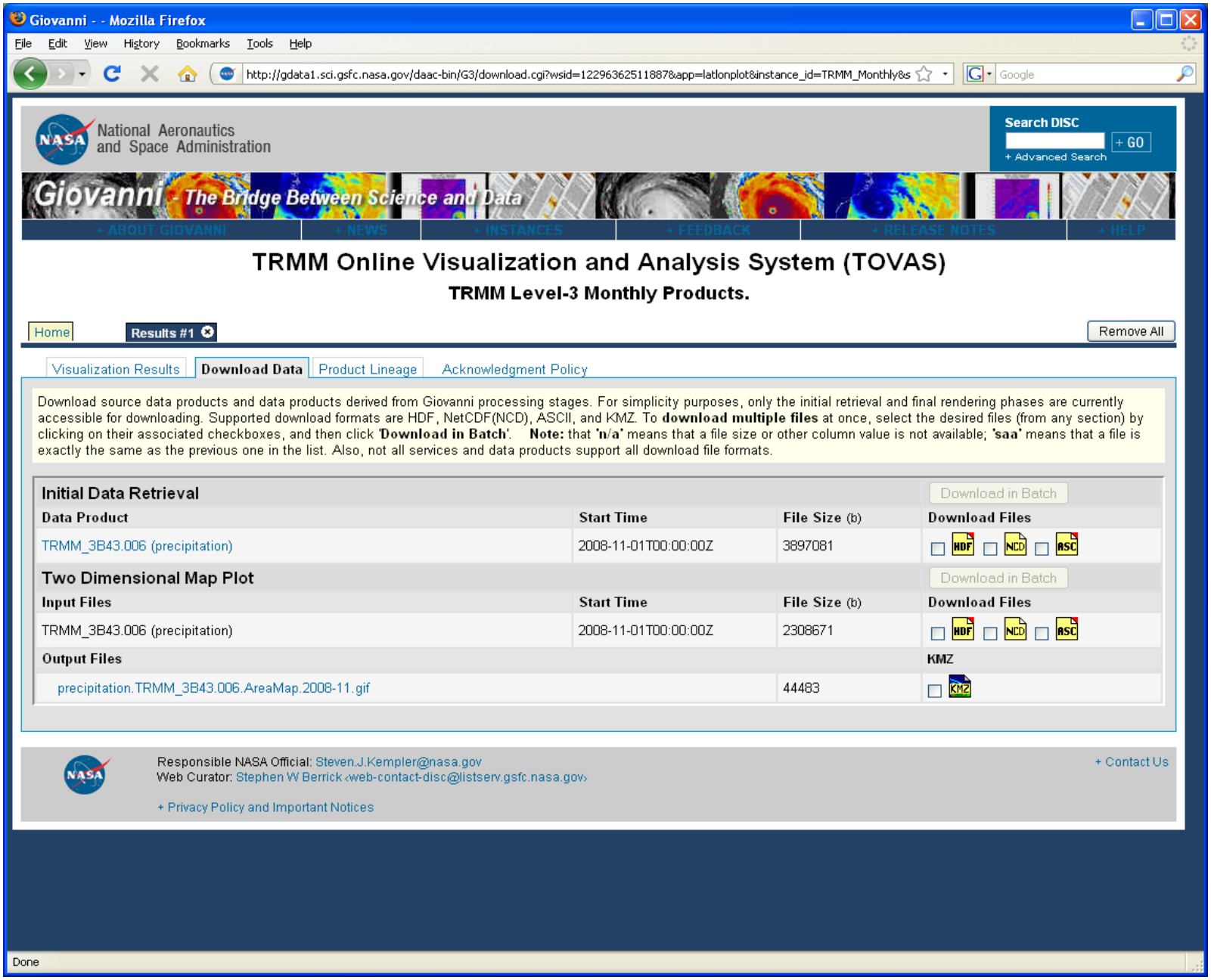
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Download source data products and data products derived from Giovanni processing stages. For simplicity purposes, only the initial retrieval and final rendering phases are currently accessible for downloading. Supported download formats are HDF, NetCDF(NCD), ASCII, and KMZ. To download multiple files at once, select the desired files (from any section) by clicking on their associated checkboxes, and then click 'Download in Batch'. Note: that 'n/a' means that a file size or other column value is not available; 'saa' means that a file is exactly the same as the previous one in the list. Also, not all services and data products support all download file formats.
Initial Data Retrieval
Download in Batch
Data Product
Start Time
File Size (b)
Download Files
TRMM_3B43.006 (precipitation)
2008-11-01T00:00:00Z
3897081
HDF
NCD
ASC
Two Dimensional Map Plot
Download in Batch
Input Files
Start Time
File Size (b)
Download Files
TRMM_3B43.006 (precipitation)
2008-11-01T00:00:00Z
2308671
HDF
NCD
ASC
Output Files
KMZ
precipitation.TRMM_3B43.006.AreaMap.2008-11.gif
44483
KMZ
Responsible NASA Official: Steven.J.Kempler@nasa.gov
Web Curator: Stephen W Berrick <web-contact-disc@listserv.gsfc.nasa.gov>
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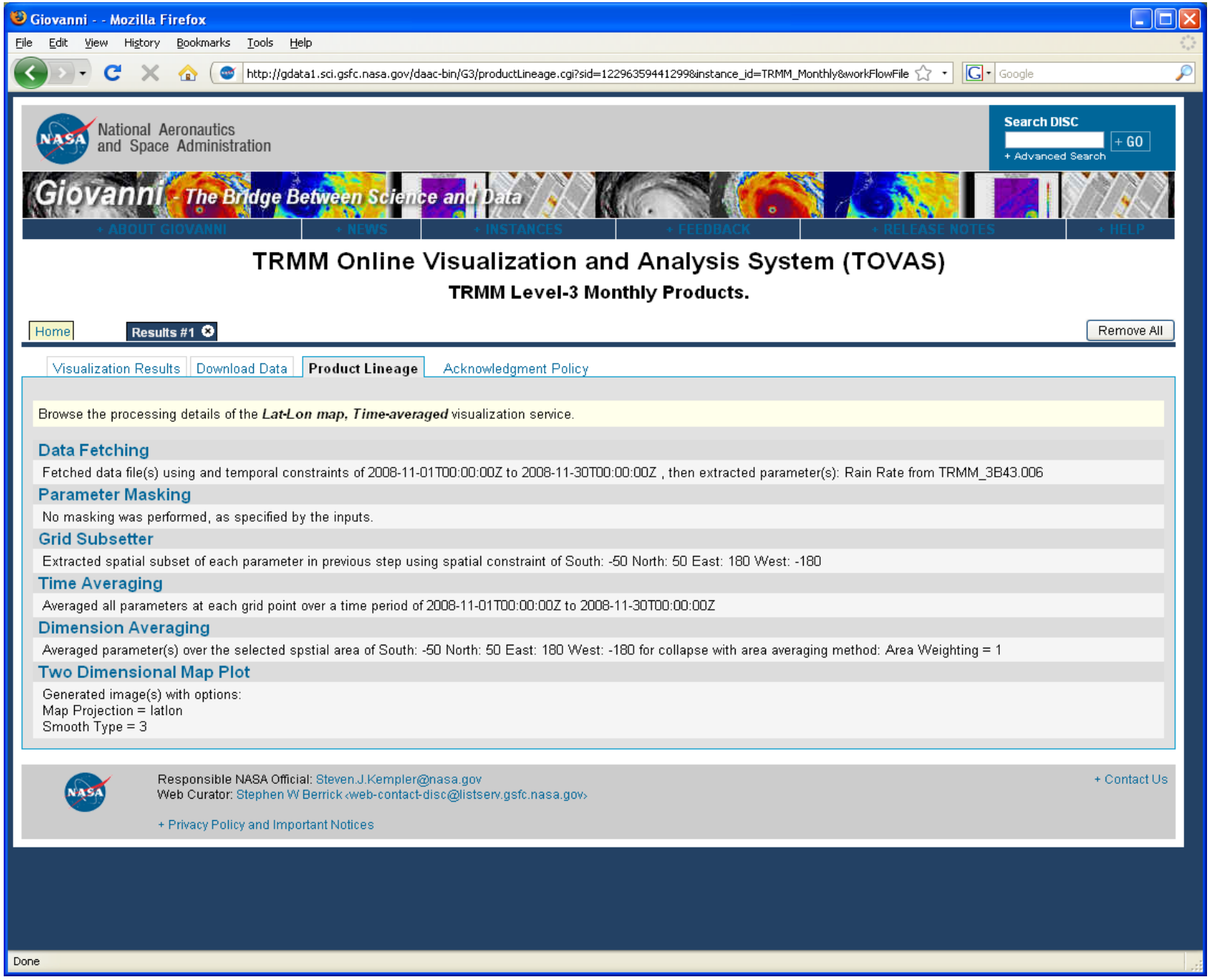
Done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http://gdata1.sci.gsfc.nasa.gov/daac-bin/G3/productLineage.cgi?sid=1229635944129&instance_id=TRMM_Monthly&workFlowFile
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Browse the processing details of the Lat-Lon map, Time-averaged visualization service.
Data Fetching
Fetched data file(s) using and temporal constraints of 2008-11-01T00:00:00Z to 2008-11-30T00:00:00Z , then extracted parameter(s): Rain Rate from TRMM_3B43.006
Parameter Masking
No masking was performed, as specified by the inputs.
Grid Subsetter
Extracted spatial subset of each parameter in previous step using spatial constraint of South: -50 North: 50 East: 180 West: -180
Time Averaging
Averaged all parameters at each grid point over a time period of 2008-11-01T00:00:00Z to 2008-11-30T00:00:00Z
Dimension Averaging
Averaged parameter(s) over the selected spstial area of South: -50 North: 50 East: 180 West: -180 for collapse with area averaging method: Area Weighting = 1
Two Dimensional Map Plot
Generated image(s) with options:
Map Projection = latlon
Smooth Type = 3
Responsible NASA Official: Steven.J.Kempler@nasa.gov
Web Curator: Stephen W Berrick ‹web-contact-disc@listserv.gsfc.nasa.gov›
+ Contact Us
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Done

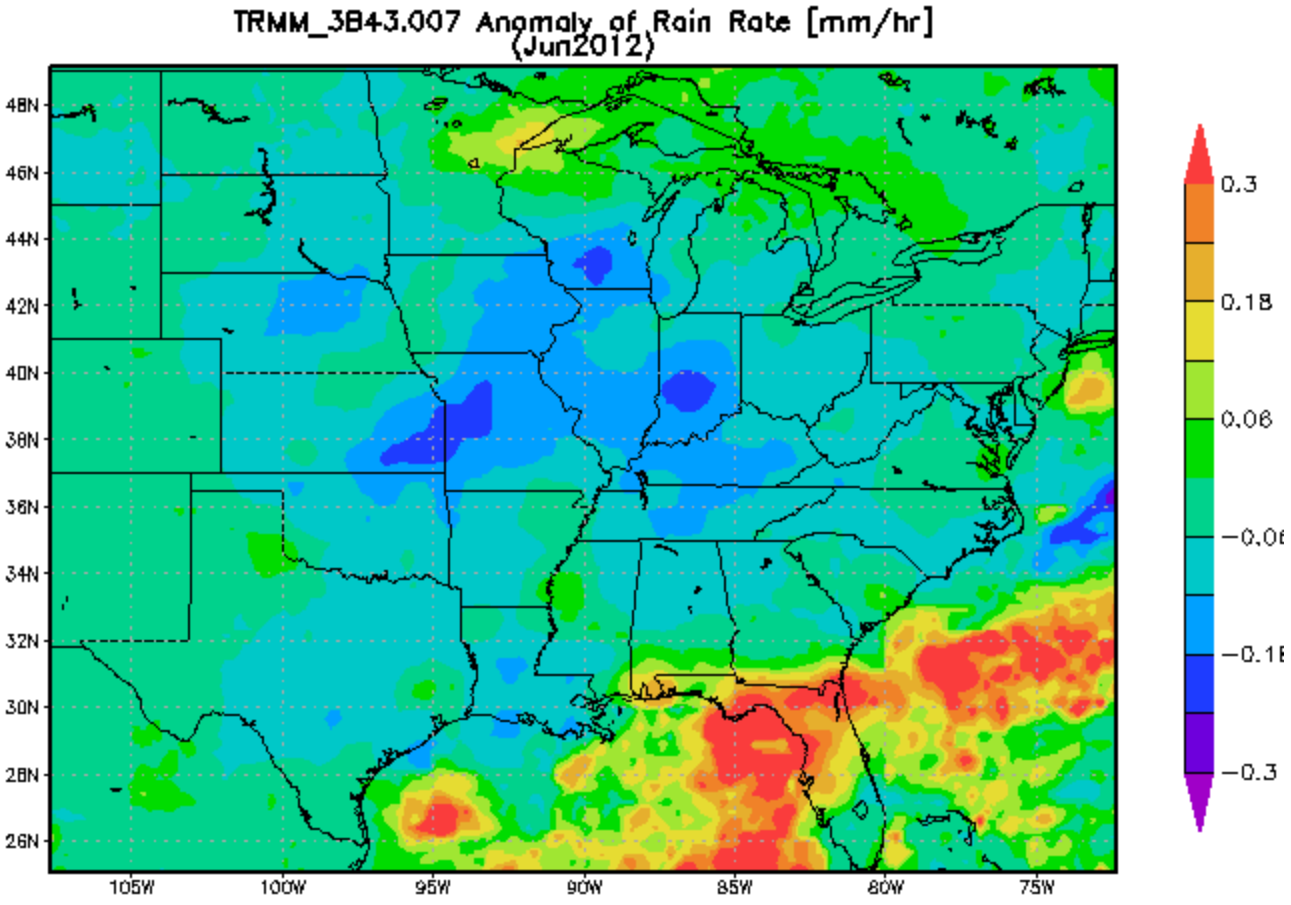
TOVAS Functions:

- Animation
- Lat-Lon Area Plot, Time-averaged
- Lat-Lon Plot, Difference Map
- Latitude-Time Hovmöller Plot
- Longitude-Time Hovmöller Plot
- Correlation Plot
- Cross-Map Plot (Latitude-Height)
- Cross-Map Plot (Longitude-Height)
- Cross-Map Plot (Time-Height)
- Scatter Plot
- Scatter Plot, Time-averaged
- Time Series, Area-averaged
- Time Series Difference
- Time Series, Area Statistics

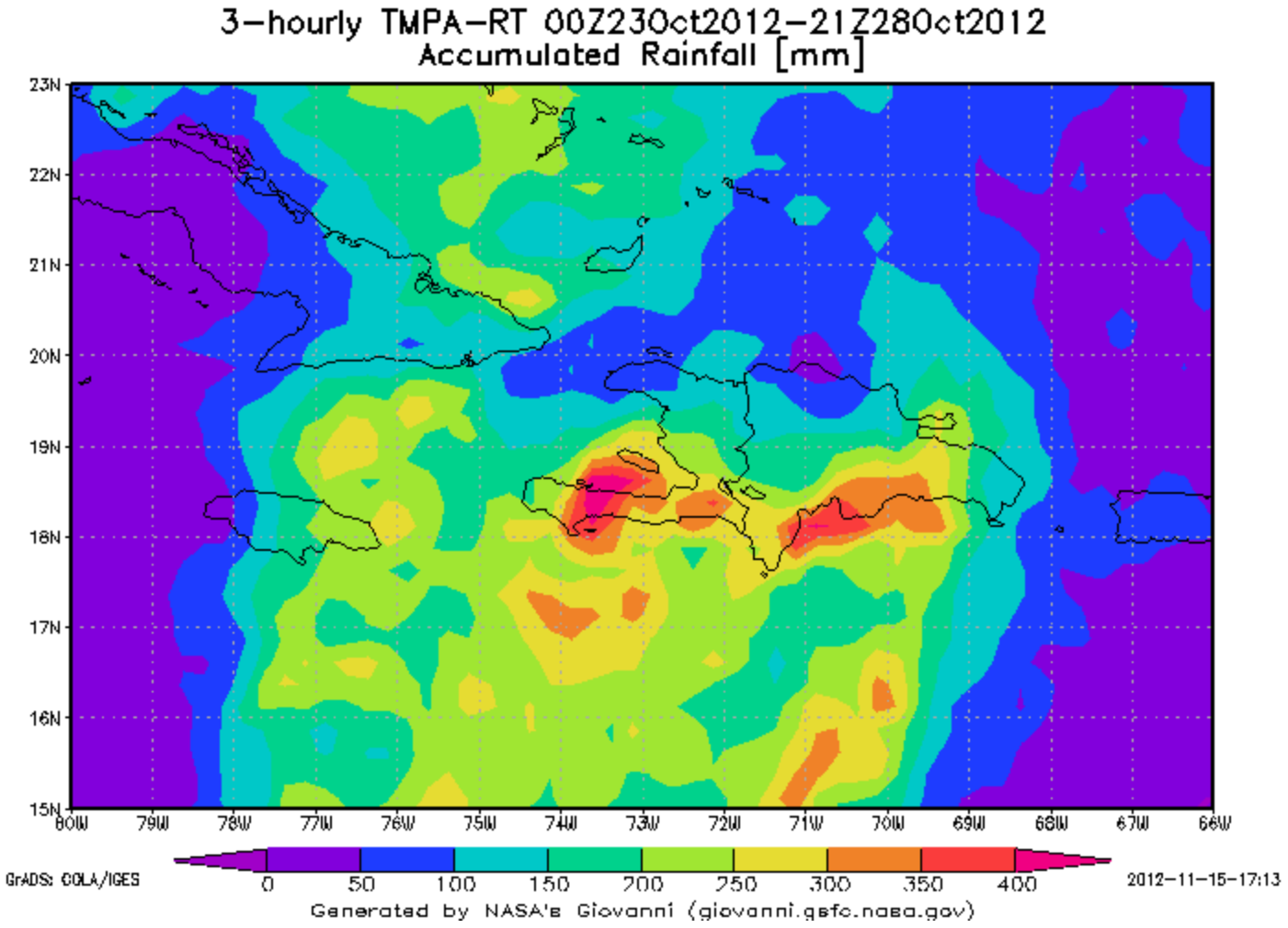
Other Features:

- Climatology
- Anomaly
- Fine tune graphic output
- Output in other formats (e.g., NetCDF)
- Google Earth KMZ file output
- FAQ and documentation
- Help desk

2012 Midwest Droughts



Hurricane Sandy



Summary of Projects and Data Products at GES DISC

http://mirador.gsfc.nasa.gov

You are here: Project

Keyword | Projects | Science Areas

A-Train | ACOS | AIRS | GLDAS | GOCART | HIRDLS | LIMS | LPRM | MERRA | MEaSUREs | MLS | MSU | NEESPI | NLDAS | OMI | SBUV | SORCE | SSBUV | TOMS | TOVS | TRMM | UARS |

Project	Description	Start Year	End Year
A-Train (30)	Collocated with CloudSat subsets of MODIS/Aqua, AMSR-E/Aqua, OMI/Aura, and POLDER/PARASOL.	2004	2012
ACOS (2)	The ACOS Level 2 product set consists of products that focus on measuring column- averaged CO2 dry air mole fraction (xco2). The measurements are extracted from observations made by JAXA's Greenhouse gases Observing SATellite (GOSAT).	2009	2012
AIRS (37)	The Atmospheric Infrared Sounder (AIRS) is a facility instrument aboard the second Earth Observing System (EOS) polar-orbiting platform, EOS Aqua. In combination with the Advanced Microwave Sounding Unit (AMSU) and the Humidity Sounder for Brazil (HSB), AIRS constitutes an innovative atmospheric sounding group of visible, infrared, and microwave sensors. Global coverage will be obtained twice daily (day and night) on a 1:30pm sun synchronous orbit from a 705-km altitude. For processing convenience, the data is divided into 6-minute files for Level 1 and 2 data. more info	2002	2012
GLDAS (12)	The Global Land Data Assimilation System (GLDAS) is generating a series of land surface state (e.g., soil moisture and surface temperature) and flux (e.g., evaporation and sensible heat flux) products simulated by four land surface models (CLM, Mosaic, Noah and VIC). Current data holdings include a set of 1.0 degree resolution data products from the four models, covering 1979 to the present; and a 0.25 degree data product from the Noah model, covering 2000 to the present.	1948	2012
GOCART (8)	The Goddard Chemistry Aerosol Radiation and Transport (GOCART) model simulates major tropospheric aerosol components, including sulfate, dust, black carbon (BC), organic carbon (OC), and sea-salt aerosols. The following is a brief description of the model. The GOCART model uses the assimilated meteorological fields of the Goddard Earth Observing System Data Assimilation System (GEOS DAS), generated by the Goddard Global Modeling and Assimilation Office. The model has a horizontal resolution of 2 deg latitude by 2.5 deg longitude or 1 deg by 1 deg, and 20-55 vertical sigma layers (depending on the version of GEOS DAS).	2000	2007
HIRDLS (6)	The High Resolution Dynamics Limb Sounder (HIRDLS) aboard the EOS Aura spacecraft (launched July 15, 2004) measures infrared emissions in 21 channels ranging from 6.12 to 17.76 microns. These measurements are used to derive vertical profiles of Ozone, HNO3, Water Vapor, Methane, N2O, NO2, N2O5, CFC11, CFC12, aerosols, and atmospheric temperature, as well as the locations of polar stratospheric clouds and cloud tops. At this time, only Ozone (O3) , Nitric acid (HNO3), CFC-11, CFC-12, Aerosol Extinction (12.1 micron), Temperature, Geopotential Height and Cloud Top Pressure are available.	2005	2008
LIMS (2)	The Limb Infrared Monitor of the Stratosphere (LIMS) instrument measured vertical profiles of temperature, geopotential height, and mixing ratios of ozone (O3), nitrogen dioxide (NO2), water vapor (H2O), and nitric acid (HNO3). The LIMS instrument was launched on the Nimbus-7 satellite and was operational for about seven months from 25 October 1978 until May 28, 1979.	1978	1979
LPRM (6)	The LPRM Level 2 (swath) and LPRM Level 3 (gridded) data sets contain land surface parameters, surface soil moisture, land surface (skin) temperature, and vegetation water content derived from passive microwave remote sensing data, using the Land Parameter Retrieval Model (LPRM). The initial versions of these data sets are based on the passive microwave measurements from the Advanced Microwave Scanning Radiometer-Earth Observing System (AMSR-E) instrument on the NASA EOS Aqua satellite (data archived at the National Snow and Ice Data Center, NSIDC). There are two separate Level 3 daily products, one ascending and one descending. The data set covers the period from June 2002 to October 2011, when AMSR-E stopped producing data. To mitigate the latter stoppage, the LPRM has also been applied to the passive microwave measurements from the Tropical Rainfall Measuring Mission (TRMM) Microwave Imager (TMI), product 1B11. There are also two separate Level 3 LPRM-TMI daily products, one nighttime and one daytime. LPRM-TMI covers the period from December 1997 to present. Spatial resolution of all Level 3 products is 0.25 degree. All the data are stored in netCDF format.	1997	2012
MERRA (63)	The Modern Era Retrospective-analysis for Research and Applications (MERRA) products are generated using Version 5.2.0 of the GEOS-5 DAS with the model and analysis each at 1/2x2/3 degrees resolution. Three-dimensional analyses are generated every 6 hours, and 3- dimensional diagnostics, describing the radiative and physical properties of the atmosphere, are 3-hourly. The product suite includes analyses on the native vertical grid as well on pressure surfaces. Two-dimensional data, including surface, fluxes, and vertical integrals, are produced hourly. The product suite includes monthly and monthly diurnal files. The MERRA production is being conducted in 3 separate streams, 1979 - 1989; 1989 - 1998; 1998 - present. Data are being uploaded to the MDISC after undergoing quality assurance in the GMAO.	1979	2012
MEaSUREs (64)	Through the MEaSUREs Program, NASA is continuing its commitment to expand understanding of the Earth system using consistent records. MEaSUREs [proposals] were [was] solicited to focus on the creation of Earth System Data Records (ESDRs), including Climate Data Records.	1970	2012
MLS (49)	The Microwave Limb Sounder (MLS) aboard the EOS-Aura spacecraft (launched July 15, 2004)measures microwave emissions from the Earth's limb at 118, 190, 240 and 640 GHz, and 2.5 THz. These measurements allow MLS to derive vertical profiles of ozone, water vapor, OH, HO2, CO, HCN, N2O, HNO3, HCl, HOCl, CLO, BrO, and SO2, as well as temperature, cirrus ice, relative humidity with respect to ice, and geopotential height.	2004	2012
MSU (8)	The Microwave Sounding Unit (MSU) scans the atmospheric column in four channels in the region of 50-60 GHz and provides daily observations of Lower Troposphere Temperature (LTT), Upper Troposphere Temperature (UTT), Lower Stratopshere Temperature (LST) and oceanic Precipitation (OP). The Limb corrections have been applied to the off-nadir observations. MSU has been flown on number of NOAA Polar Orbiting Environmental Satellites (POES)since 1979.	1979	1994
NEESPI (16)	The NASA Northern Eurasia Earth Science Partnership Initiative (NEESPI) data holdings focus on collecting satellite remote sensing data from different sensors in support of the NEESPI scientific objectives.	2000	2012
NLDAS (5)	The North American Land Data Assimilation System (NLDAS) provides precipitation, land-surface states (e.g., soil moisture and surface temperature), and fluxes (e.g., radiation and latent and sensible heat fluxes) by integrating observations from numerous sources combined with land-surface modeling. Phase 2 of NLDAS comprises hourly data from Jan 1979 to present (with a 2- to 5-day lag) at 1/8th-degree grid spacing over the contiguous United States and parts of Canada and Mexico.	1979	2012
OMI (42)	The Ozone Monitoring Instrument (OMI) aboard the EOS Aura spacecraft (launched July 15, 2004) is a nadir pointing hyper-spectral imaging sensor that provides daily global measurements of earth-atmosphere back scattered radiances in 1560 wavelength bands in the ultraviolet and visible spectral region (264 to 504 nm) at a spatial resolution of 13x24 km. Also once a month, OMI provides measurements in a spatial zoom mode at a resolution of 13 x 12 km. These measurements are used to retrieve column amount of O3, NO2, SO2, and Aerosols (four of the U.S. Environmental Protection Agency's six criteria pollutants), as well as HCHO, BrO, OClO, Ozone Profiles, Effective Cloud Fraction and Pressure, and Surface Erythemal UV-B Irradiances.	2004	2012

Summary of Projects and Data Products at GES DISC (Cont')

SBUV (4)	Ozone Profile and Total Column Ozone Version-8 data from NASA SBUV sensor on Nimbus-7 and NOAA SBUV/2 sensors on NOAA-09, 11 and 16 (data released on DVD in 2004)	1978	2003
SORCE (7)	The Solar Radiation and Climate Experiment (SORCE) mission measures the solar radiation incident at the Earth's atmosphere. Data products are available containing the total solar irradiance, and solar spectral irradiance, both at 6 hourly and daily averages.	2003	2012
SSBUV (2)	The Shuttle Solar Backscatter Ultraviolet (SSBUV), nearly identical to Nimbus-7 SBUV and NOAA SBUV/2 instruments flown on eight space shuttle missions (1989-1996) provided earth-atmosphere backscattered radiances at 12 UV wavelengths between 252-340 nm and solar spectral UV irradiances over the wavelength range 200-406 nm with a resolution of 1.1 nm. Ozone profile, ozone total column, aerosol index, effective scene reflectivity and solar spectral irradiance data retrieved from these observations were used for the validation of satellite measurements.	1989	1996
TOMS (32)	The Total Ozone Mapping Spectrometer (TOMS) has been successfully flown on four satellites (Nimbus-7, Meteor-3, Earth-Probe, and ADEOS) for daily monitoring of regional and global distribution of atmospheric ozone. TOMS has provided almost 30 years (1978-2006) long-term record of atmospheric ozone observations that has helped scientists in understanding the global ozone trend, ozone hole and ozone recovery. Though TOMS was designed for ozone monitoring, it also provided valuable information on the sources of tropospheric aerosols (dust and smoke) and its long-range transport, volcanic SO2, erythemal UV exposure, and effective reflectivity of the earth's surface and clouds.	1978	2005
TOVS (21)	The TIROS Operational Vertical Sounder (TOVS) instrument package provides information on temperature and humidity profiles, total ozone, clouds and radiation on a global scale. The Pathfinder processing of the data products using fixed algorithms provides a wealth of climatological information. TOVS has been carried aboard NOAA polar orbiting weather satellites since 1978, and continues to the present.	1978	1995
TRMM (83)	The Tropical Rainfall Measuring Mission (TRMM) is a joint endeavor between NASA and Japan's National Space Development Agency. It is designed to monitor and study tropical rainfall and the associated release of energy that helps to power the global atmospheric circulation, shaping both global weather and climate. more info	1993	2012
UARS (25)	The Upper Atmosphere Research Satellite (UARS) data set consists of daily near global (-80 to +80) measurements of atmospheric trace gases, temperature, aerosols and wind profiles, as well as measurements of solar UV spectra and charged particles injected into the Earth's atmosphere.	1991	2005

TRMM and Other Precipitation Products

You are here: Project » TRMM

Keyword | Projects | Science Areas

TRMM

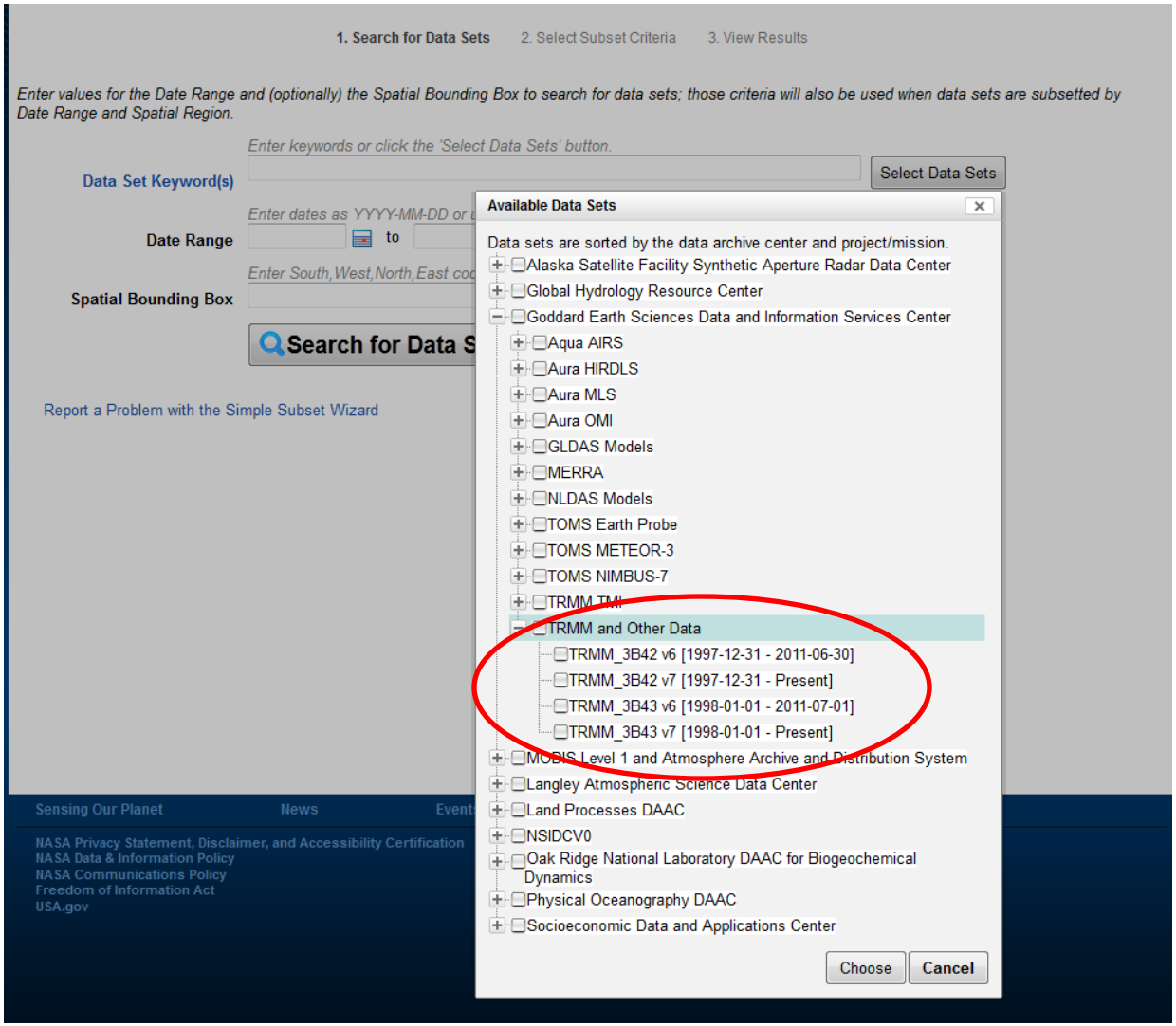
The Tropical Rainfall Measuring Mission (TRMM) is a joint endeavor between NASA and Japan's National Space Development Agency. It is designed to monitor and study tropical rainfall and the associated release of energy that helps to power the global atmospheric circulation, shaping both global weather and climate.

Data Group	Description	Date Range
Ancillary (1)	TRMM Ancillary data products	2000-02-07 to 2012-10-05
Climatology (12)	TRMM Composite Climatology (TCC) consists of a merger of selected TRMM rainfall products over both land and ocean to give a "TRMM-best" climatological estimate. Inputs to the composite were selected based on knowledge of the performance of the retrievals, limitations of the algorithms, and the presence of artifacts.	1998-01-01 to 2010-05-31
Gridded (18)	Gridded data products from VIRS, TMI, and PR, at a range of spatial and temporal resolutions	1997-12-01 to 2012-10-01
Ground-based Instrument (15)	Ground-based instrument data products	1995-01-03 to 2012-09-30
Orbital (13)	Orbital data products from VIRS, TMI, and PR, at the sensor's resolution	1997-12-07 to 2012-10-06
Subset (23)	Parameter, gridded, regional gridded, and coincidence subset data derived from TRMM standard data products	1993-01-01 to 2012-10-06

The Most Popular Products

3B31 (Version 006): Monthly 5 x 5 degree Combined Rainfall info	Rain rate, cloud liquid water, rain water, cloud ice, graupels at 14 levels for a latitude band from 40 degree N to 40 degree S, from PR and TMI **Available Services:** Convert to KMZ Download via HTTP	1997-12-01 to 2011-07-01	160	0.369
3B31 (Version 007): Monthly 0.5 x 0.5 degree Combined Rainfall info	Rain rate, cloud liquid water, rain water, cloud ice, graupels at 28 levels for a latitude band from 40 degree N to 40 degree S, from PR and TMI **Available Services:** Download via HTTP	1997-12-01 to 2012-09-30	174	36.639
3B42: (Version 6) 3-Hour 0.25 x 0.25 degree merged TRMM and other satellite estimates info	Calibrated IR merged with TRMM and other satellite data **Available Services:** Convert to gzipped NetCDF Convert to NetCDF Convert to KMZ Download via HTTP	1997-12-31 to 2011-06-30	39432	0.315
3B42: 3-Hour 0.25 x 0.25 degree merged TRMM and other satellite estimates info	Calibrated IR merged with TRMM and other satellite data **Available Services:** Convert to gzipped NetCDF Convert to NetCDF Download via HTTP	1998-01-01 to 2012-07-31	42607	0.753
3B43: (Version 6) Monthly 0.25 x 0.25 degree merged TRMM and other sources estimates info	Merged 3B-42 and rain gauge estimates **Available Services:** Convert to NetCDF Subset Spatially and/or by Parameter as NetCDF Convert to KMZ Download via HTTP	1998-01-01 to 2011-07-01	164	4.415
3B43: Monthly 0.25 x 0.25 degree merged TRMM and other sources estimates info	Merged 3B-42 and rain gauge estimates **Available Services:** Convert to NetCDF Subset Spatially and/or by Parameter as NetCDF Download via HTTP	1998-01-01 to 2012-07-31	177	4.948
CSH: Monthly 0.5 x 0.5 degree Convective/Stratiform Heating info	TRMM Monthly 0.5 x 0.5 degree Convective/Stratiform Heating **Available Services:** Convert to KMZ Download via HTTP	1997-12-01 to 2011-07-01	160	7.741
TRMM_3B42_daily.006 info	Daily TRMM and Others Rainfall Estimate (3B42 V6 derived) **Available Services:** Convert to gzipped NetCDF Convert to NetCDF Download via HTTP	1997-12-31 to 2011-06-30	4930	2.197
TRMM_3B42_daily.007 info	Daily TRMM and Others Rainfall Estimate (3B42 V7 derived) **Available Services:** Convert to gzipped NetCDF Convert to NetCDF	1997-12-31 to 2012-07-31	5327	2.197

Simple Subset Wizard



EOSDIS Home

SIMPLE SUBSET WIZARD (SSW) V1.07 RELEASE NOTES

1. Search for Data Sets 2. Select Subset Criteria 3. View Results

Enter values for the Date Range and (optionally) the Spatial Bounding Box to search for data sets; those criteria will also be used when data sets are subsetted by Date Range and Spatial Region.

Enter keywords or click the 'Select Data Sets' button.

Data Set Keyword(s) (TRMM_3B43 7) Select Data Sets

Enter dates as YYYY-MM-DD or use the calendars.

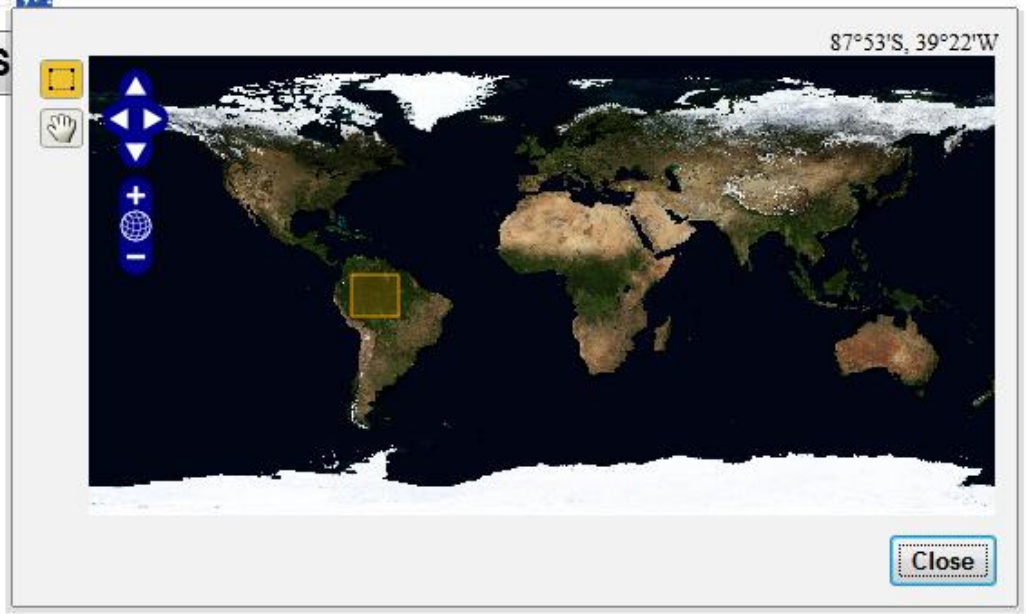
Date Range 1998-01-01 to 1998-12-31

Enter South,West,North,East coordinates or use the map.

Spatial Bounding Box -11.95,-73.83,4.22,-55.55

Search for Data S

Report a Problem with the Simple Subset Wizard



SIMPLE SUBSET WIZARD (SSW) V1.07 RELEASE NOTES

1. Search for Data Sets **2. Select Subset Criteria** 3. View Results

Found 1 subsettable data set.

Subset: Spatial Region (-11.95,-73.83,4.22,-55.55), Variables for TRMM_3B43 v7 in netCDF

- netCDF
- gzipped netCDF

Number of Variables selected=1

- [x] precipitation
- [ ] relativeError
- [ ] weight

Back to Search | Subset Selected Data Sets | View Subset Results

SIMPLE SUBSET WIZARD (SSW) V1.07 RELEASE NOTES

1. Search for Data Sets 2. Select Subset Criteria **3. View Results**

Subset: Spatial Region (-11.95,-73.83,4.22,-55.55), Variables for TRMM_3B43 v7

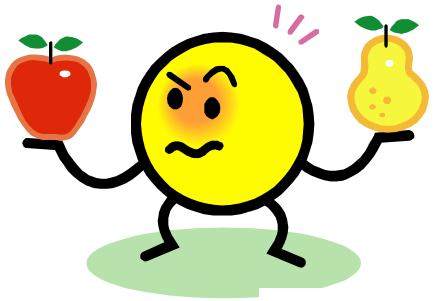
(Get list of URLs for this subset in a file) (Downloading instructions)

1. 3B43.19980101.7.SUB.nc
2. 3B43.19980201.7.SUB.nc
3. 3B43.19980301.7.SUB.nc
4. 3B43.19980401.7.SUB.nc
5. 3B43.19980501.7.SUB.nc
6. 3B43.19980601.7.SUB.nc
7. 3B43.19980701.7.SUB.nc
8. 3B43.19980801.7.SUB.nc
9. 3B43.19980901.7.SUB.nc
10. 3B43.19981001.7.SUB.nc
11. 3B43.19981101.7.SUB.nc
12. 3B43.19981201.7.SUB.nc

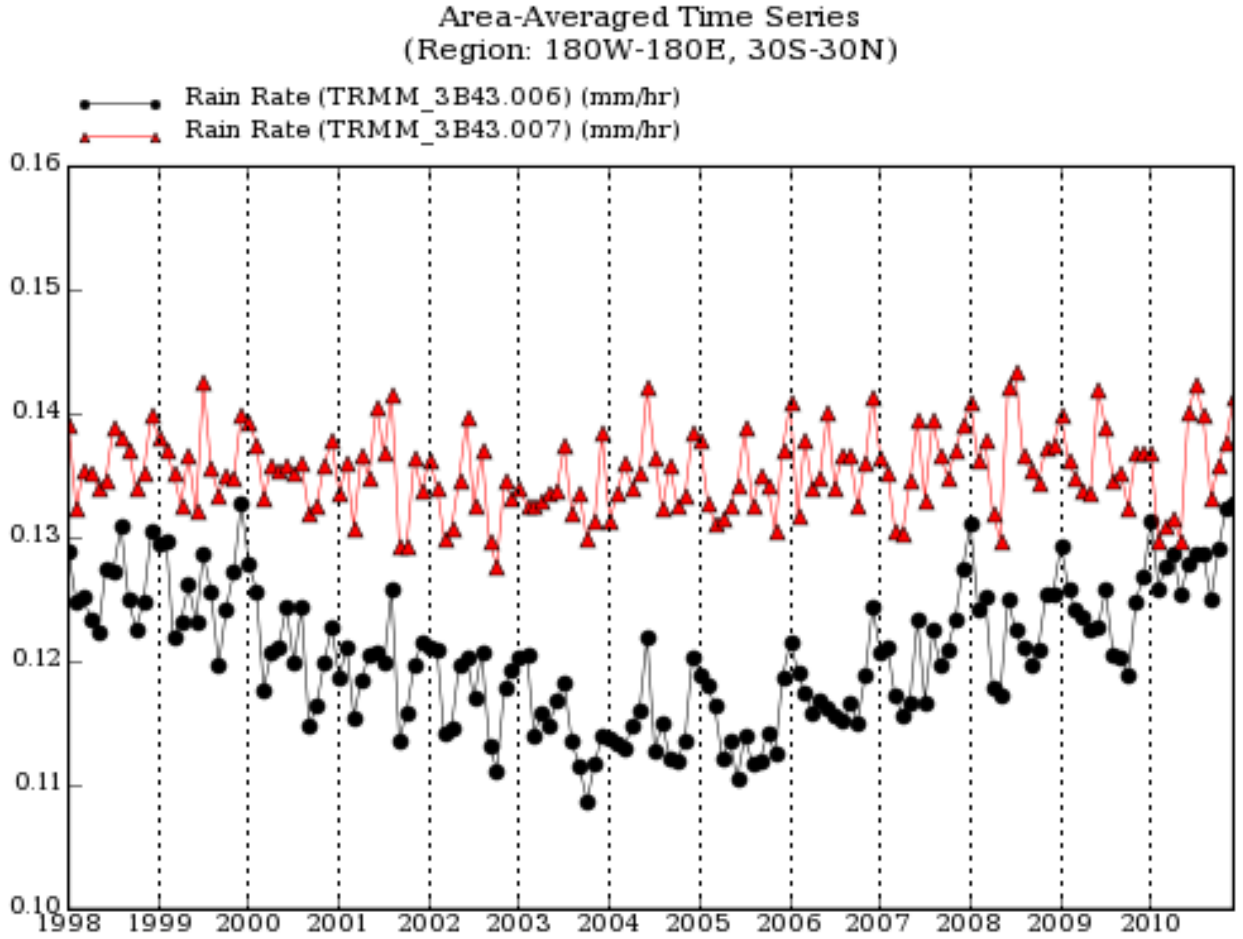
Start Over | Back to Subset Criteria

Additional Data Services

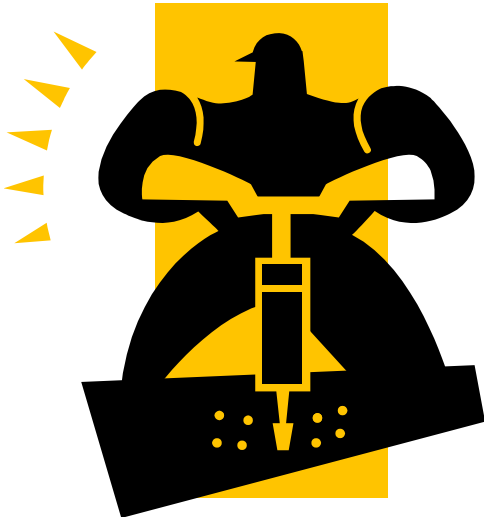
- Data via OPeNDAP (http://disc.sci.gsfc.nasa.gov/services/opendap/) that can be used for remote access to individual variables within datasets in a form usable by many tools, such as IDV, McIDAS-V, Panoply, Ferret and GrADS;
- GrADS-DODS Data Server or GDS (http://disc2.nascom.nasa.gov/dods/);
- The Open Geospatial Consortium (OGC) Web Map Service (WMS) (http://disc.sci.gsfc.nasa.gov/services/wxs_ogc.shtml) that allows the use of data and enables clients to build customized maps with data coming from a different network;
- Providing NASA gridded hydrological data access through CUAHSI HIS (Consortium of Universities for the Advancement of Hydrologic Science, Inc. - Hydrologic Information Systems).



Inter-comparison of Rainfall Products

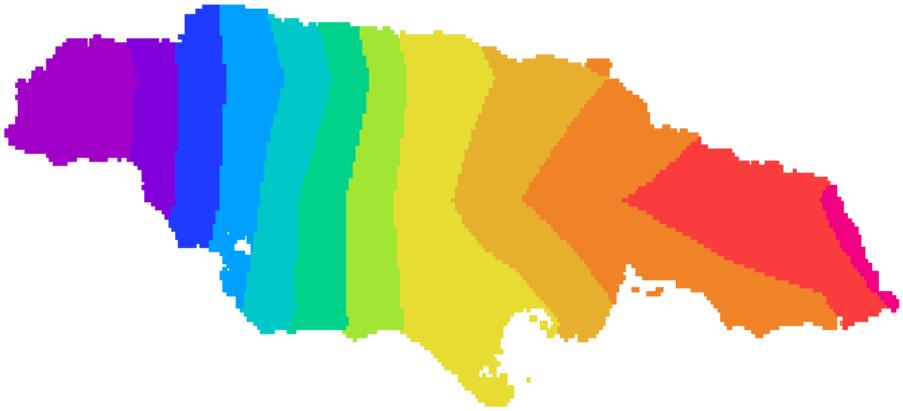


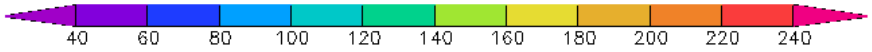
Ongoing Work



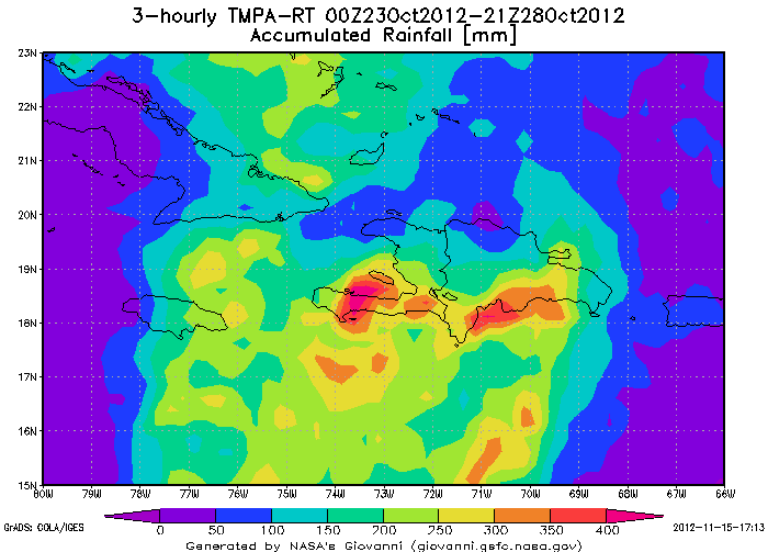
- Rainfall map for countries
- Time series for countries
- More services (i.e., anomaly, etc.)

Hurricane Sandy

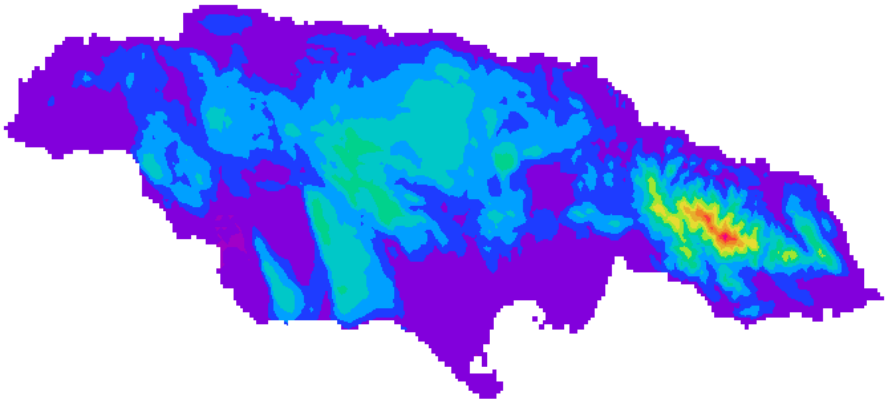




mm



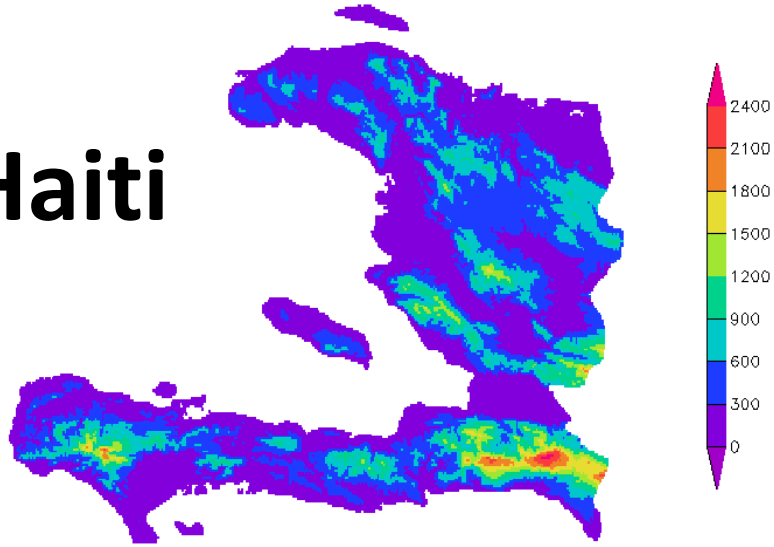
Jamaica



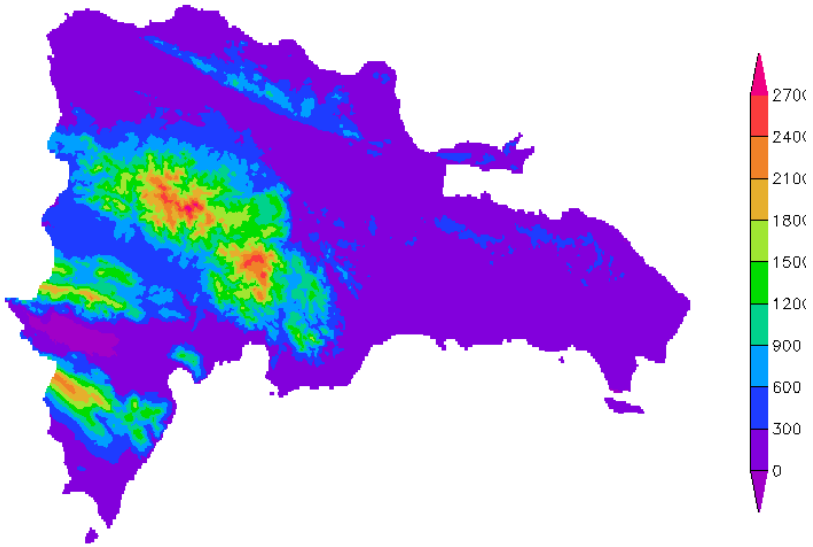
Elevation (m)

Dominican Republic

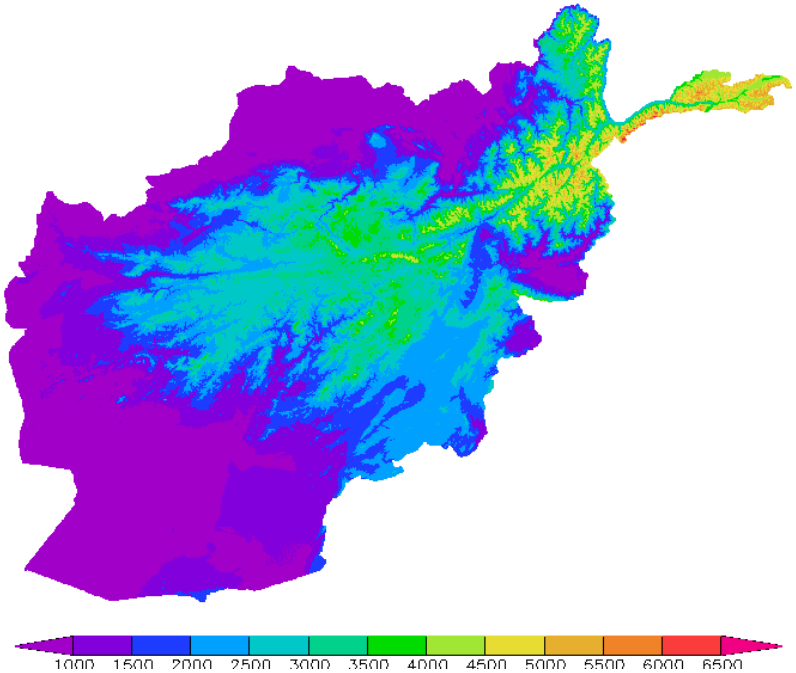
Haiti



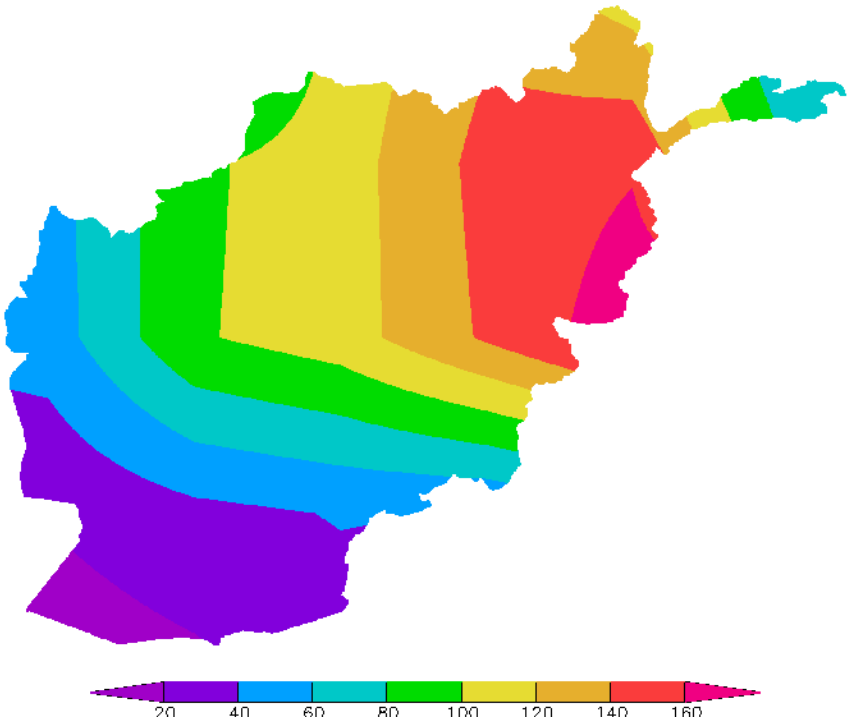
Elevation (m)



Elevation (m)

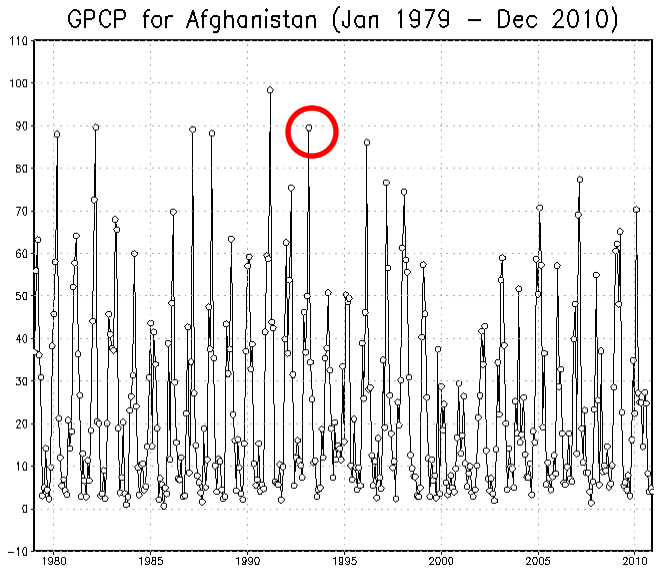


Elevation (m)



Precipitation (mm)
Mar. 1993

Afghanistan



Precipitation Product Applications

- USDA Crop Explorer
- Current Conditions

USDA Crop Explorer

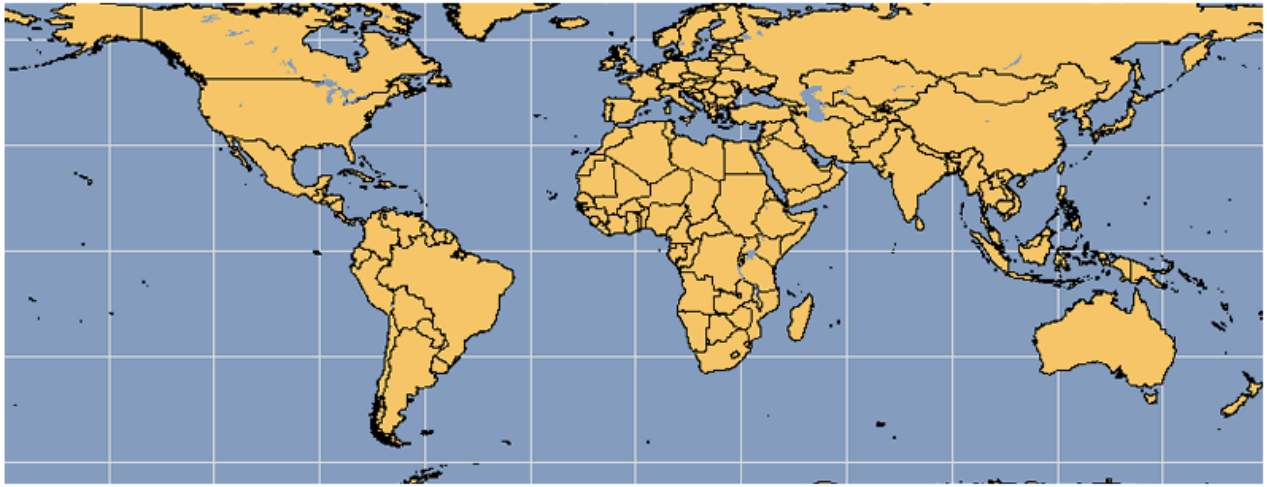
USDA United States Department of Agriculture
Foreign Agricultural Service

Linking U.S. Agriculture FAS to the World

Crop Explorer

Toolbox

*Click on map to get **TMPA accumulated rainfall** for the latest 10-day period*



Introduction

The U.S. Department of Agriculture's Foreign Agricultural Service (USDA-FAS), in cooperation with the National Aeronautics and Space Administration's (NASA) Goddard Earth Sciences Data and Information Services Center (GES DISC), has been routinely using satellite-derived data to monitor precipitation around the world. A key feature of this project is its use of near-real time global satellite precipitation data in an operational manner. Satellite precipitation products are produced by NASA via a semi-automated process and made accessible from this Web site for USDA and public viewing. Monitoring precipitation for agriculturally important areas around the world greatly assists the USDA-FAS to quickly locate regional weather events, as well as improve crop production estimates.

Data Processing

Top

The NASA Goddard Space Flight Center (GSFC) system to produce the "TRMM and Other Data" estimates in real time was developed to apply new concepts in merging quasi-global precipitation estimates and to take advantage of the increasing availability of input data sets in near real time. The overall system is referred to as the "Version 6 TRMM Real-Time Multi-Satellite Precipitation Analysis." For convenience, it is referred to here as the "TMPA-RT."

The TMPA-RT is run quasi-operationally on a best-effort basis at the NASA Precipitation Processing

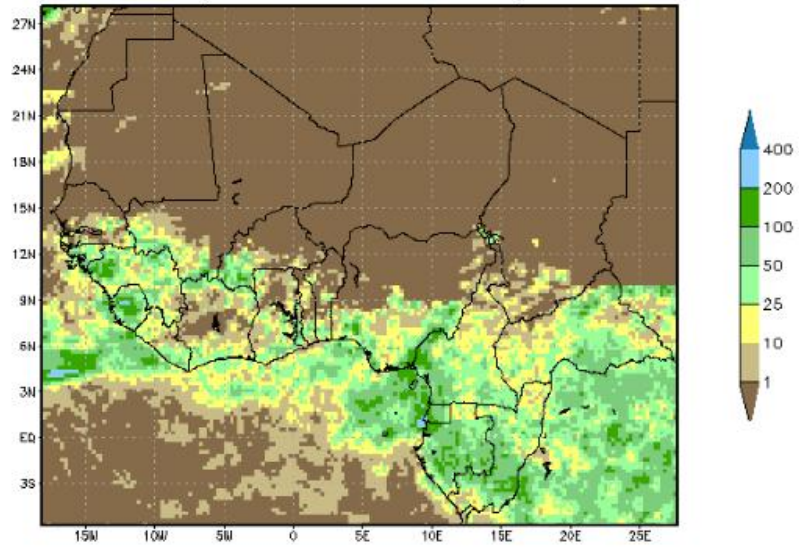
USDA United States Department of Agriculture
Foreign Agricultural Service

Linking U.S. Agriculture FAS to the World

Crop Explorer

Home | Return to Previous Page (Note: This is a Beta version)

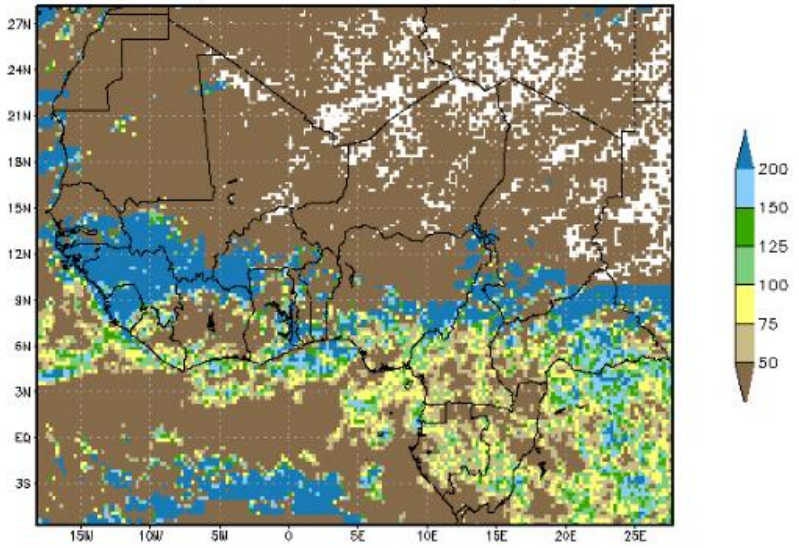
TMPA-RT Precipitation [mm]
(01nov2012 - 10nov2012)



GrADS: COLA/IGES 2012-11-20-21:00 GrADS: COLA/IGES

Generated by NASA's Giovanni (giovanni.gsfc.nasa.gov)

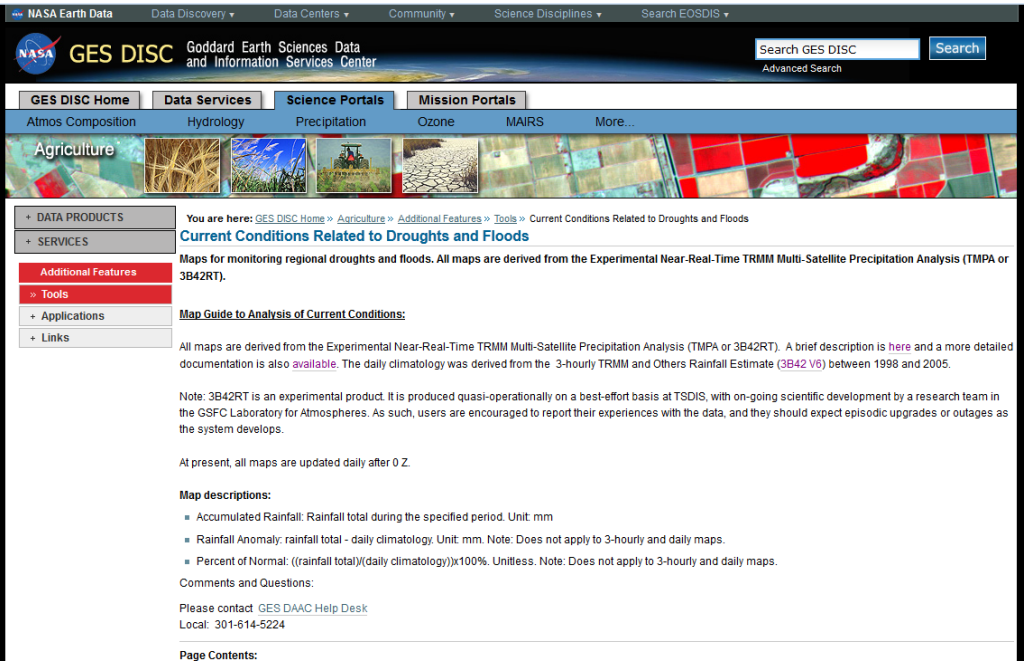
TMPA-RT Decadal Percent Normal Precipitation [%]
(01nov2012 - 10nov2012)



2012-11-20-2

Generated by NASA's Giovanni (giovanni.gsfc.nasa.gov)

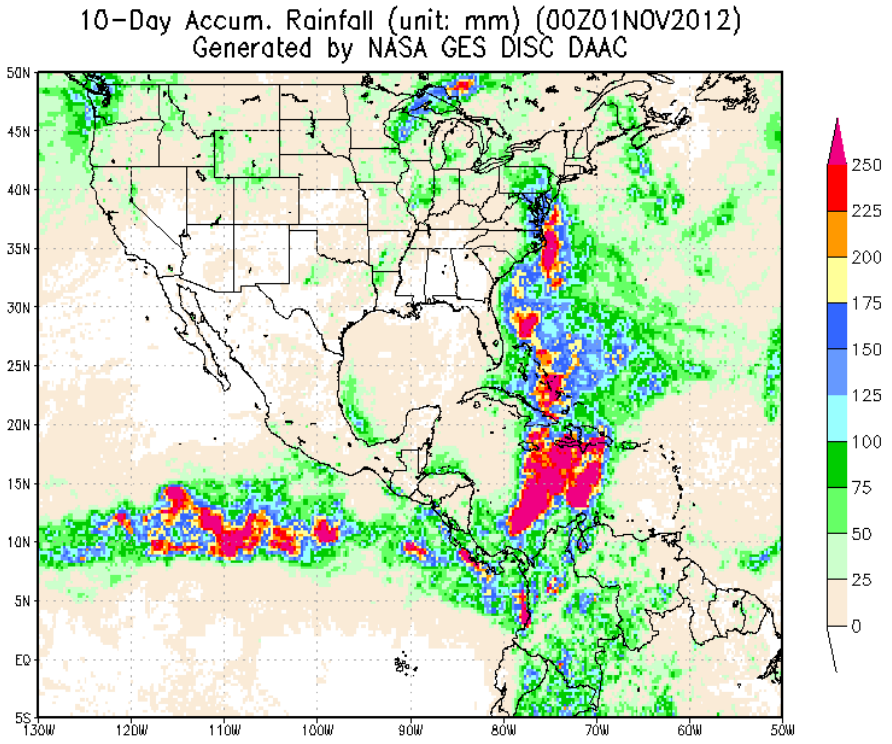
Current Conditions

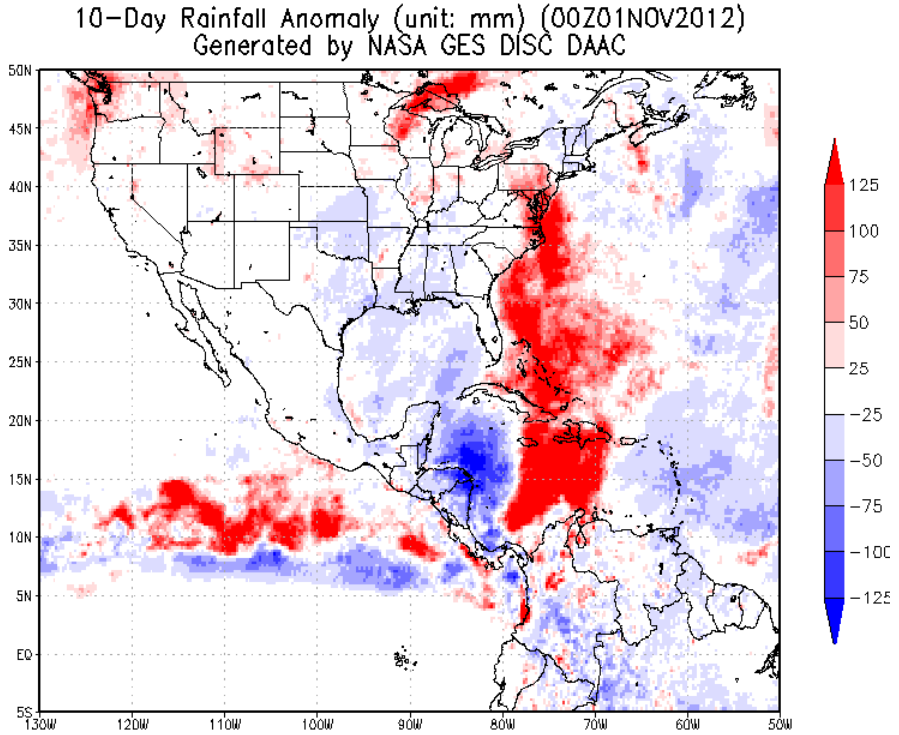


3 Hours | 24 Hours | 10 Days | 30 Days | 60 Days | 90 Days

10-day Global and Regional Rainfall Maps			
	Accumulated Rainfall	Rainfall Anomaly	Rainfall Percent of Normal
Global	✓	✓	✓
Northern Hemisphere	✓	✓	✓
Southern Hemisphere	✓	✓	✓
North America	✓	✓	✓
South America	✓	✓	✓
Southeast Asia	✓	✓	✓
Central Asia	✓	✓	✓
Europe	✓	✓	✓
Australia	✓	✓	✓
Africa	✓	✓	✓
West Africa	✓	✓	✓
USA	✓	✓	✓
NE USA	✓	✓	✓
NW USA	✓	✓	✓
Central USA	✓	✓	✓
SE USA	✓	✓	✓
SW USA	✓	✓	✓

Hurricane Sandy





Summary

- Satellite based global precipitation products available for different application needs
- Other ancillary data (hydrological data assimilation, Reanalysis) are available
- Data services and online tools are available to support applications

URLs:

- Mirador: http://mirador.gsfc.nasa.gov/
- TOVAS: http://disc2.nascom.nasa.gov/Giovanni/tovas/
- Simple Subset Wizard: http://disc.sci.gsfc.nasa.gov/SSW/
- Crop Explorer: http://www.pecad.fas.usda.gov/cropexplorer/
- Current Conditions: http://disc.sci.gsfc.nasa.gov/agriculture/additional/tools/current_conditions.shtml
- GES DISC: http://disc.sci.gsfc.nasa.gov/
- TRMM: http://trmm.gsfc.nasa.gov

Contact: Zhong.Liu@nasa.gov or gsfc-help-disc@lists.nasa.gov